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Aspects of the Diachronic (In)stability of Complex Morphology[1]

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1. Introduction

The cross-linguistic study of morphological structure has a long and rich tradition that is connected to the very beginnings of language typology. Proposals going back to the end of the 18th and start of the 19th century (cf. e.g. Ramat 2010, 16-17, Plank 2001) have survived remarkably well into modern-day typology (see e.g. Aikhenvald 2007 for a modern version), which can be seen as a tribute to quality of the the early work in morphological typology. A good deal of knowledge about diachronic morphological change has been built up over the years, including studies of processes of desyntactization and dephonologization give rise to morphology (see e.g. Bybee 1985, 1995, Joseph 2003, Helmbrecht 2004, Anderson 2014 and references in these publications), and frequency-driven attrition leading to the loss of morphology (see e.g. Bybee 2001 and references therein). However, much less is known about the relative diachronic stability of particular morphological (sub)systems, and to what extent that stability is consistent in different parts of the world. This lack of knowledge of relative stability is a point that can be made more generally about language structure. There is no widely accepted list of structural characteristics that are highly resistant to change equivalent to the Swadesh list for the lexicon (Swadesh 1971). A more particularly morphological problem is that many analytical problems still surround the notion of word (see e.g. Dixon & Aikhenvald 2002, Schiering et al. 2010, Haspelmath 2011, Anderson 2014) and morphological language profiles (e.g. Fortescue 1994, Bickel & Nichols 2007). A third complicating factor is that the dynamics of linguistic diversity, and the many factors that may influence these dynamics remain very elusive, in spite of a lively research agenda (e.g. Nichols 1992, Nettle 1999a, Bickel 2007, Evans & Levinson 2009).[2]

A number of chapters in the *World Atlas of Language Structures Online* (Dryer & Haspelmath, eds. 2013) suggest certain tendencies for different aspects of the diachrony of morphological systems. For instance, Bickel & Nichols (2013a) discussing inflectional synthesis, conclude that "especially outside Africa and Australia, the distribution is geographically very uneven. In particular, Eurasia is dominated by low-synthesis languages and the Americas (especially North America) by high-synthesis languages". Further morphologically oriented chapters of WALS which appear to show geographically skewed morphological patterns are Baerman & Brown 2013 on case syncretism, which is particularly frequent in Eurasian languages, isolating and non-linear tendencies in inflection in northern Africa (Bickel & Nichols 2013b), prefixing morphology in southern Africa and North America (Dryer 2103), locus of marking shows very few dependent-marking languages in the Americas (Nichols & Bickel 2013). This begs the question why the distribution of at least some morphological patterns tends to show areally skewed patterns.

[1] I thank Balthasar Bickel, Mathias Pache, and two anonymous reviewers for useful comments on an earlier version of this paper. Remaining errors are mine.

[2] It is beyond the scope of this paper to give a historical overview of the field of morphological typology. Historical overviews focusing on early achievements can be found in e.g. Plank 1991, 2001, Ramat 2010, Graffi 2010.

The purpose of this special issue is to bring together specialists of different areas and/or language families to shed their light on the development of morphology in different circumstances. In order to make the different areal and genealogical perspectives more comparable we have chosen to focus on situations where complex morphology is involved. Moreover, because the main locus of morphological complexity in morphologically complex languages is often the verb, we also chose to focus on verbs. The different contributions to the special issue will be introduced briefly at the end of this introductory paper.

In this introduction I illustrate in very broad strokes some of the major recurring issues in the different contributions, discussing some of the challenges to do with the diachrony of morphological systems, relating to language contact (section 3), deep-time retention of structural patterns (section 4), and issues in the analysis of morphological structures (section 5). Before going into these perspectives, however, I briefly discuss the notion of complexity in more detail (section 2). Due to limitations of time and space, this introduction can only scratch the surface of the topic of diachronic (in)stability of morphological complexity, leaving it to the different contributions to go into more elaborate detail for the individual case studies.

2. Types of Morphological Complexity

The term morphological complexity is complex in itself in that there are many ways in which morphological structures can be complex. Kusters (2003, 2008) discusses several ways in which (inflectional) morphology can be complex from the perspective of a language learner.[3] The types of complexity discussed by Kusters (2003) are relative, and based on three basic principles of 'ideal' morphology: transparency, isomorphism, and economy. The Transparency Principle (see also Hengeveld 2011) requires morphemes to conform to a one-form-one-meaning ideal. To a language learner, morphemes that have cumulative exponence, like the morpheme *-ó* in Spanish in example (1), are less transparent and therefore more complex to learn.[4]

Spanish [INDO-EUROPEAN, ROMANCE]
(1) habl-ó
speak-3SG.PAST.PRFV.IND
'He spoke.'

Another way in which a deviation from the one-form-one-meaning ideal can take shape is through homonymy. This is especially common in paradigms, where it is known as syncretism. For instance, the nominative masculine and dative feminine form of the German definite article are identical - see example (2)

[3] The issue of how to measure complexity is a topic in its own right. Kusters (2003) chooses the perspective of a second language learner to measure relative complexity in terms of learning costs. Other measures are based on first language acquisition, reaction times, or measured brain activity, each with their own challenges (see Sinnemäki 2014 for an overview).

[4] The following abbreviations are used in this paper: A agent ; AND andative ; APPL applicative ; AUX auxiliary ; CAUS causative ; CLF classifier ; CNT continuative ; DAT dative ; DET determiner ; ERG ergative ; F feminine ; FM formative ; IMP imperative ; IND indicative ; INSTR instrument ; INTNS intensity ; ITE iterative ; LIG ligature ; M masculine ; NOM nominative ; OBJ object ; P patient ; PAST past tense ; PL plural ; POT potential ; PRFV perfective ; REC reciprocal ; SG singular ; SUBJ subject.

German [INDO-EUROPEAN, GERMANIC]

(2) Der Mann folgt der Frau
the.NOM.SG.M man follows the.DAT.SG.F woman
'The man follows the woman.'

In fact, the paradigm of German articles does not have a single unique form, as shown in Table 1.

	MASCULINE	**NEUTER**	**FEMININE**	**PLURAL**
NOM	der	das	die	die
GEN	des	des	der	der
DAT	dem	dem	der	den
ACC	den	das	die	die

Table 1: German case/gender/number paradigms of the definite article

Another type of deviation from the Transparency Principle is the situation where there are more forms to convey a single meaning. Like is the case with one-form-several-meanings situation, the several-forms-one-meaning problem may arise both syntagmatically, e.g. in circumfixes - see example (3) from Guillaume 2008: 115) and paradigmatically, in the case of e.g. inflection classes, see Table 2.

Cavineña [TACANAN]

(3) e-ra=mi **e**-bawitya-**u** [i-ke bawe=kwana=ke].
1SG-ERG=2SG **POT**-teach-**POT** 1SG-FM know=PL=LIG
'I could teach you what I know.'

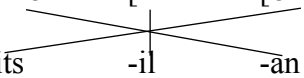
		I	II	III	IV
sg	nominative	zakon	gazet-a	kost'	vin-o
	accusative	zakon	gazet-u	kost'	vin-o
	genitive	zakon-a	gazet-y	kost-i	vin-a
	dative	zakon-u	gazet-e	kost-i	vin-u
	instrumental	zakon-om	gazet-oj	kost'-ju	vin-om
	locative	zakon-e	gazet-e	kost-i	vin-e
pl	nominative	zakon-y	gazet-y	kost-i	vin-a
	accusative	zakon-y	gazet-y	kost-i	vin-a
	genitive	zakon-ov	gazet	kost-ej	vin
	dative	zakon-am	gazet-am	kost'-am	vin-am
	instrumental	zakon-ami	gazet-ami	kost'-ami	vin-ami
	locative	zakon-ax	gazet-ax	kost'-ax	vin-ax
		'law'	'newspaper'	'bone'	'wine'

Table 2: The four main nominal inflection classes in Russian (Corbett 2006: 129).

The isomorphism principle states that the order of morphological elements should be consistent with syntactic, semantic, or pragmatic scope relations (see e.g. Baker 1985, Bybee 1985 for

theoretical proposals based on these principles). This means that an example like (4) from Chichewa (Hyman 2003: 251) is complex.

Chichewa [NIGER-CONGO, BANTU]
(4) [ROOT [REC [APPL [CAUS]]]]



mang -its -il -an
tie -CAUS -APPL -REC
'cause to tie each other with'

The order of affixes in terms of semantic scope would be as indicated in the top line of (4), which is, however, an ungrammatical ordering in Chichewa. Instead, the order given below the top line must be used, which goes against scope principles, and is therefore assumed to be more complex to a language learner.

The economy principle states that, ideally, the number of (combinations of) semantic categories is as restricted as possible. From this principle it would follow that languages with high synthesis are more complex morphologically than those with low synthesis.[5] An example of a high-synthesis word comes from the Bolivian language Itonama (Crevels 2012: 247) in (5), consisting of a root with 9 dependent morphemes.

Itonama [ISOLATE]
(5) k-a'-ki-pu-<chu~><h-u-><chu~>chuh-te
F-2SG-IMP-CLF:lying.down.SG-<ITE~><AND-INTNS-><ITE~>inside-CNT
'Go on kneeding (the dough)!'

It is this third type of complexity that is the target of most of the papers in this volume. Assessing the degree of synthesis has a rather long history. A full treatment of different approaches to this question is beyond the scope of this paper, but I briefly discuss three publications that deal in different ways with measuring or assessing morphological synthesis and in that way illustrate several choices that can be made with respect to measuring (poly)synthesis.[6]

Sapir (1921) regarded morphological synthesis as a parameter in its own right, logically independent of the parameter of technique, contrasting analytic, synthetic, and polysynthetic languages on a scale.

> An analytic language is one that either does not combine concepts into single words at all (Chinese) or does so economically (English, French). In an analytic language the sentence is always of prime importance, the word is of minor interest. In a synthetic language (Latin, Arabic, Finnish) the concepts cluster more thickly, the words are more richly chambered, but there is a tendency, on the whole, to keep the range of concrete significance in the single

[5] Riddle (2008) and Bisang (2009) argue that complexity in isolating languages resides elsewhere, namely in lexical patterns - e.g. reduplication, compounding, serial verb constructions (Riddle 2008) or in the semantic underspecification and concomitant context-driven interpretations (Bisang 2009). See Gil (2008), however, for a different view.

[6] I do not mean to say here that these publications are representative for the entire field, but they are chosen because they illustrate particular contrastive choices in their approaches to measuring synthesis.

> word down to a moderate compass. A polysynthetic language, as its name implies, is more than ordinarily synthetic. The elaboration of the word is extreme. Concepts which we should never dream of treating in a subordinate fashion are symbolized by derivational affixes or "symbolic" changes in the radical element, while the more abstract notions, including the syntactic relations, may also be conveyed by the word (p. 128).

Sapir presented the synthesis parameter as logically independent of a second one, that of technique, where isolating, agglutinating, and symbolic morphological processes are contrasted.

Greenberg (1960) transforms Sapir's typology into a number of measurable indices, thus trying to pin down the position of individual languages on Sapir's scales with more precision. He moreover proposes a number of refinements, as well as some additions to Sapir's typology. In total, Greenberg proposes 5 basic 'indices', with refinements 10 in total, for morphological typology in the form of ratios. The ratio for synthesis is the morphemes-per-word ratio (M/W).[7] The lower limit of this index is 1.00, and there is no theoretical maximum, but Greenberg mentions an empirical upper limit around 3.00. Counts are made on the basis of texts, so they refer to usage data.

Bickel & Nichols (2007) also build on Sapir's (1921) typology, and suggest some further reorganizations and refinements. They propose three orthogonal scales: degree of fusion, flexivity, and semantic density. The third parameter falls into two sub-scales: exponence and synthesis, the former refers to the level of the morpheme (cumulative versus separative), the latter to the level of the grammatical word, measured by counting the number of categories that can be marked on a particular class of words (see also Bickel & Nichols 2013a).

There are a number of challenges and questions for the measurement of morphological synthesis that recur in the different approaches sketched above, and different choices that can be made with respect to them. First, and perhaps foremost, the three authors make different choices with respect to the unit of comparison. Whereas the unit of the word plays a central role in all three approaches, Sapir and Greenberg look at all types of words in a language and come to some measure that allows them to compare entire languages. Bickel & Nichols restrict their approach first of all by comparing only at the level of the grammatical word, excluding clitics and including those elements that form separate phonological words but not separate grammatical words.[8] Moreover, they compare grammatical words that belong to the same lexical class. The advantage of this approach is that one avoids effects of word classes with contrary synthetic patterns cancelling each other out. It does, however, introduce another set of problems related to the definition of word classes (see e.g. Croft 2001).

A second, related question is how to define the minimum unit of analysis. As mentioned, Greenberg includes non-concatenative morphological patterns as they correspond to form-meaning correspondences elsewhere in the language, i.e. there must be some regularity for these rules beyond the individual morpheme. Likewise, Bickel & Nichols calculate the number of grammatical (inflectional) categories per word, defined as "any grammatical category whose presence or shape is (at least in part) a regular response to the grammatical environment" (Bickel

[7] Greenberg also counts non-concatenative operations as morphemes, as long as it corresponds to a systematic form-meaning covariation in the language (p. 189).

[8] Greenberg also explicitly argued for a grammatically defined word (morphological word in his terminology) rather than a phonologically defined one. Greenberg's morphological word crucially rests on a combination of syntactic independence and substitutability of morpheme and morpheme strings.

& Nichols 2013a). In spite of the different names and phrasing of the definition, the approaches seem to be rather in agreement on this issue.

Third, where Bickel & Nichols and Sapir measure synthetic potential of words or word classes in particular languages, Greenberg sets out to measure how much of this potential is actually used on the basis of language corpora. This is a very reasonable thing to do, since a language may have a very high potential synthesis value, but in practice the actual occurrence of syntagmatically complex words may be virtually non-existent. The disadvantage of such an approach is that it can only be done for languages with a sufficiently large corpus of natural data.

Fourth, a valid question is what part of morphology is taken into consideration. Sapir considered all morphology, but distinguished four types of concepts: radical concepts, derivational concepts, mixed-relational concepts, and relational concepts. The first two categories readily translate to more modern notions as roots and derivational morphemes, the latter two relate to those morphemes that are grammatical in nature, relevant to the relations between the words in a sentence. The mixed-relational types have semantic load, the pure-relational concepts do not, i.e. they do not add any or very little semantics to the morpheme complex. Greenberg dismisses the distinction between pure relational and mixed-relational concepts, and collapses them under the heading of inflection. Greenberg proposed three synthesis indices: the inflectional morphemes per word ratio, the derivational morphemes per word ratio, and the root morphemes per word ratio (to deal with compounds). Bickel & Nichols (2013a), finally, explicitly limit themselves to morphology that is "relevant to syntax" (i.e. inflectional morphology). Bickel & Nichols (2007) moreover regard the difference between synthesis and polysynthesis to relate to the fact whether verbs in a language allow for noun incorporation (N-V compounding).

A final point to be made here is that all three approaches focus on syntagmatic complexity. Arguably, however, if one regards synthesis as the degree of morphologization of concepts, paradigmatic complexity is relevant as well, as each cell in a paradigm represents the morphological expression of a concept or a combination of concepts. Using the number of categories per word does allow you to capture some of the paradigmatic complexity, but certainly not all.

These and other challenges make it quite hard to pin down the notion of morphological synthesis. I discuss problems related to wordhood and morphological types in more detail in section 5, but first I discuss two possible explanations for the apparent geographical skewing of synthesis patterns, at least based on the approach of Bickel & Nichols (2013a).

3. Morphological Patterns as the Result of Contact-Induced Diffusion

A first thought that comes to mind when confronted with areally skewed patterns is to consider contact-induced diffusion as a factor contributing to their distribution. In this section I will briefly explore this line of inquiry, highlighting some of the challenges and open questions associated with it.

In principle, it seems perfectly possible for languages to change their morphological type as a result of contact. This is for instance shown in Yaron Matras' and Jeanette Sakel's small but detailed database, on the basis of which Matras concludes that "a number of languages show signs of movement between morphological types" (2007: 40). He finds examples of decreased morphological complexity, like decreased synthesis in Nahuatl and Imbabura Quichua, Otomi, and Guaraní, de-morphologization towards isolating and analytical types in Indonesian and

Purépecha, but also adoption of concatenative strategies in Hup, which can be regarded as increased complexity. Nevertheless, we are left with a number of open questions with respect to contact as a potential contributor to the areal skewing of morphological structures.

Bickel (in press) argues for two types of events that lead to language change (including contact-induced language change): (i) event-based processes, isolated accidents of history, which have a limited geographical spread, and (ii) functional processes: more general cognitive and communicative pressures that promote larger geographical spreads. The occurrence of particular morphological structures over large contiguous areas mentioned above seems to point at the fact that functional pressures play an important role. Nevertheless, it is unclear what the functional pressures favoring particular morphological profiles would be, especially since different morphological profiles seem to be equally successful spreaders and strongholds in different areas.

A second issue related to language contact is that contact is often said to lead to simplification, especially when second language acquisition is involved (see e.g. Trudgill 2004) and indeed the contact-induced morphological changes discussed in Matras (2007) seem to be predominantly leading to simpler morphology. However, it is unclear how this can be reconciled with (poly)synthetic areas like the Americas. It has often been mentioned that in terms of simplification, the outcome of language contact is highly influenced by the degree of bilingualism (see e.g. Thomason & Kaufman 1988).[9] It may be that in areas with more complex morphologies, (past) contact situations involved widespread and full (and infant) bilingualism (see Mithun, this issue), or it may be that polysynthesis is ancestral and relatively untouched by language contact. Whether this can explain the distribution of more complex versus less complex morphologies is another open question.

A third contact-related issue is that many theories of language contact include a notion of identification in some form in contact-induced language change: a functional equivalence between two morphemes in different languages. Different kinds of contact-induced processes therefore involve some type of equivalence that would lead to semantic or functional convergence. Although it has been observed by several scholars that language contact does not lead to complete functional identity very often (Wiemer & Wälchli 2012), one would still expect some degree of functional/semantic convergence, at least more than before contact. Figure 1 schematically represents three highly simplified types of contact events: one (borrowing) where a marker including its function is borrowed from language A into language B, thereby perhaps slightly altering both form and function (represented by the A'). In the situation below that termed replication, following Heine & Kuteva's (2005, 2007) terminology - also called pattern (as opposed to matter) borrowing in Matras & Sakel's (2007) terminology - the function of an existing form in language B which is for some reason identified with a morpheme in language A is adapted under the influence of the function of the source marker. In convergence, the functions of both markers change as the result of a more mutual influence. In all of these cases the languages become more alike functionally.

[9] In fact, language contact may in some cases be argued to lead to complexification of morphology (as is perhaps the case in Hup mentioned above), see also e.g. Rivierre (1994), Bakker (2004), Grant (2009), as well as Mithun (this issue) and Van Gijn (this issue).

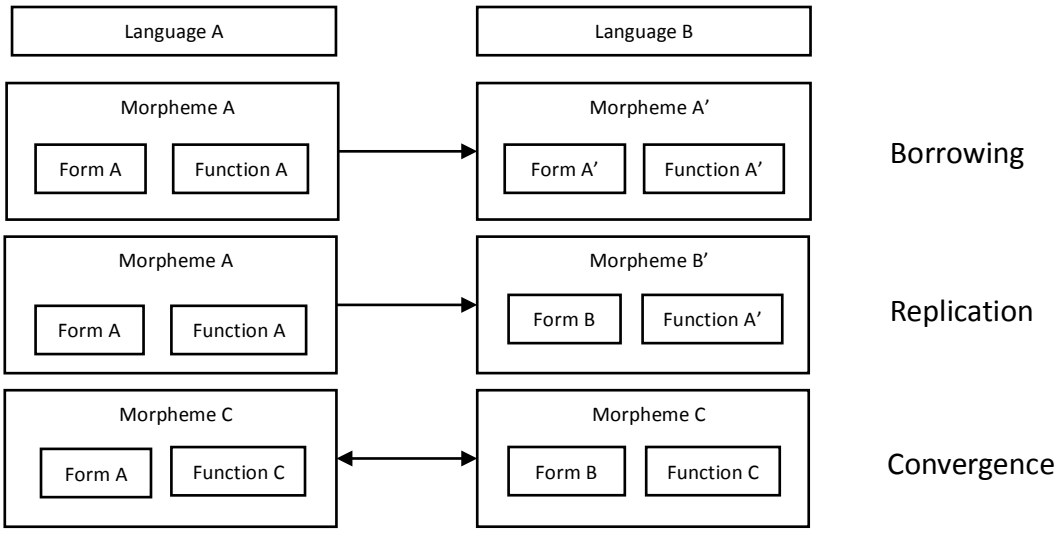


Figure 1: three types of contact-induced change

These considerations lead to another set of questions.

> *To what extent is there a correlation between similar abstract morphological and semantic aspects of morphology across languages within a contact area?*
> If languages are similar in their morphological profile as a result of contact, one would expect, given the above considerations, that they become more similar in terms of the functions that are marked morphologically as well. In this way functional similarity can be indicative of contact-induced morphological change. However, we do not know to what extent and in what way we should take this into account. More specifically, the following two questions need to be addressed.
>
> *At what level of detail should we look at semantics? To what extent should we expect functional (semantic) identity?*
> If constructions or markers tend almost never to become completely functionally identical as a result of contact, another question relates to the degree of fuzziness we should allow for when analyzing functional similarity between morphemes in two languages.
>
> *Are certain functions of morphemes potentially more indicative of contact-induced change than others?*
> Languages may be similar for several reasons, e.g. because of universal cognitive pressures, because of dependencies within the grammar of a single language, and because of contact, or because of a combination of these. At this point, we do not know very much about the relative stability of different categories (see the next section) or about relative susceptibility to diffuse as a result of contact.

The latter point relates to observations that, just like some forms are borrowed more easily than others, some meanings are more likely to transfer horizontally than others. This is apparent for instance in the work of Weinreich (1953), who made some predictions about likelihood of transfer, as shown in Figure 2, adapted from Wilkins (1996).

Formal properties			Content-related properties			Likelihood of transfer
bondedness	form	variance	Use	Function	Meaning	
Tight	Reduced	Flexive	Obligatory	Grammatical	Non-affective	-
						↕
Free	Robust	Nonflexive	Optional	lexical	affective	+

Figure 2: Weinreich's parameters for the likelihood of transfer (Wilkins 1996)

The question is whether one would expect more agreement between languages in a morphological area in terms of optionally present, lexical, and affective meanings.

Answering these and undoubtedly many other questions will help us get closer to answering the question whether contact-induced diffusion could be responsible for the skewed patterns of morphological structure.

4. Morphological Complexity as Deep-Time Retention

Another conceivable answer to the question how we can explain the skewed distribution of morphological patterns is that, rather than representing contact-induced diffusion, the common structures represent older, highly stable layers of linguistic structure. The line of inquiry that linguistic structure may give us signals that go well beyond the the ca. 8000 years of time depth associated with lexical comparison is pursued by Dunn et al. (2005), who say that "the structural features of a language, like the lexicon, are subject to processes of decay over time and can also be borrowed or exchanged across languages. However, such exchange usually only occurs under special conditions of prolonged and intensive contact, and it is at least plausible that where the lexical signal has been lost, a faint structural signal might still be discernible."

It is, however, probably the case that not all structural features behave in the same way when it comes to diachronic stability. For lexical comparison we have a (often criticized) list of stable lexemes (Swadesh list). As was mentioned in the beginning of this introduction, there is no equivalent of that for language structure yet. Although there are a few papers that have looked into the matter (see below in this section), this has not led to a clear consensus.

Arguably the first to propose a systematic approach to stability of linguistic structural features was Nichols (1992). She compares four structural macro variables, each with three possible gross types, locus of marking (head-marking, dependent-marking, double-split marking - on the basis of the proportion of constructions that behaves according to one of these patterns), alignment (accusative, ergative, split/hierarchical), complexity (low, medium, high), and word order (verb-initial, verb-medial, verb-final), across 8 language stocks as well as across 9 macro areas. She comes to the following ranking, from Nichols (1992: 167):

alignment < complexity < H/D type < word order

The more to the left a variable, the more genetically determined its values are (i.e. the more consistent within stocks as opposed to areas), the more to the right the more areally determined (the more consistent in areas as opposed to stocks). Morphological complexity (in Nichols'

approach the number of inflectional relational markers) thus ends up towards the more genealogically stable end of the continuum. In a more recent programmatic paper, Nichols (2003) proposes to refine the interpretation of 'stability' relative to different diachronic processes, i.e. stability means relative "resistance to change, loss, or borrowing" (ibid. p. 284), and should be established across different sociolinguistic, areal, and genealogical circumstances. Nichols distinguishes three basic types of events that may happen to elements of language in language evolution: they may be inherited by daughter languages, they may be acquired (e.g. through borrowing, substrate effects, or 'selection' following universally preferred patterns), or they may be lost. On the basis of these parameters, Nichols comes to a more refined typology of stability.

Since Nichols' seminal work, more scholars have proposed approaches to measuring stability. This line of research was given a special impetus with the appearance of WALS (Haspelmath et al. 2005) and even more so by the publication of the online version (Dryer & Haspelmath 2013), which provided easy access to many typological data points. Dediu & Cysouw (2013) compare eight stability measures that either have made use of the WALS data set in the original papers or, in the case of Maslova (2002, 2004) have been applied to the WALS dataset *post hoc* by Dediu and Cysouw. The approaches differ in what they consider to be stability or in aspects of stability that they highlight. The basic assumption in Cysouw et al. (2008: 263) is that "the consistency of a particular linguistic feature can be established by comparing it to the overall structure derived from summarising over all features. More consistent features will show a stronger match to that overall structure." In other words, consistent features yield similar distances between languages as all the combined features. The authors propose three ways to test the fit between individual-feature matrices and overall matrices: the first method (CM) is based on the Mantel test, whereby the rows of one of the matrices are permutated several times. After each permutation the correlation between the two matrices is recalculated. For actually correlated matrices, permutations are expected to lead to higher correlation coefficients less often than non-correlated matrices. The second method, the coherence method (CC), calculates distances by comparing three languages L1, L2, an L3, and deducting the distance between L1 and L2 from the sum of distances between L1 and L3 and between L2 and L3, giving an 'excess' value they describe as roughly the extra distance to be travelled between L1 and L2 when the route is taken via L3, instead of taking a direct path from L1 to L2. For each feature, the triangle coherence index is the average of the triangle coherence of all possible language triplets with respect to that feature. The consistency of that feature is then again calculated by comparing it to the average triangle coherence index of all combined features. The third method is a rank method (CR) in which, for each language, a ranking of relative similarity to that language is created. The distance of a language L1 to a language L2 is then given in terms of the number of languages that are closer to L1 than L2. In a second step, for each feature and language the set of all languages with the same feature value is determined. If a feature is consistent, the sum of the ranks of the languages in this subset should be significantly smaller than the one in the other subset (for mathematical details the reader is referred to Cysouw et al. 2008).

The three methods described above are significantly different from the other five methods compared in Dediu & Cysouw (2013) in that, unlike the others, they do not take into account genealogical or areal relations between the languages. Dediu (2011) measures stability by mapping a feature value in related languages WALS onto a phylogenetic tree of that language family, in order to estimate the rate of change of a particular feature within a language family, based on two different methods. In order to make cross-family comparisons possible, the rates of

change of the different features were converted into ordered lists per language family, ranked from the most stable to the least stable features. Areality in this approach (D) is not considered.

Parkvall (2008) regards stability essentially as resistance to being borrowed. He calculates the average homogeneity of a feature within predefined geographical areas (as far as possible on the basis of anthropological literature) and within genealogical units by averaging over all areal and genealogical units, respectively (for mathematical details see Parkvall 2008 and Dediu & Cysouw 2013). Dediu & Cysouw (2013) evaluate two different measures discussed in Parkvall (2008), P1 and P2, that differ in what families are taken into consideration. In P1, all families available in WALS are taken into consideration, in P2 only the 12 least controversial ones: Algonquian, Austronesian, Narrow Bantu, Dravidian, Indo-European, Iroquoian, Mayan, Mongolian, Semitic, Sino-Tibetan, Turkic, and Uralic. Parkvall comes to a stability measure based on the ratio between genealogical and areal homogeneity.

Wichmann & Holman (2009) propose a measure of stability (W) that is conceptualized as resistance to change, whether family-internal or by diffusion. They calculate the proportion of related languages that share a particular value for a feature F, as well as the proportion of unrelated languages (limited to languages pairs spoken within 5000 km from each other). Their stability measure is based on the difference between the proportion of unrelated languages with the same feature value and related languages with the same feature value, weighted by the maximum value of that difference.

Maslova (2002, 2004), finally, describes a method (M) to determine transition probabilities between feature values for pairs of closely related languages. Transition probabilities are then calculated by taking the proportion of these pairs for which the feature value is the same, corrected for the number of values a feature can have. Dediu & Cysouw (2013) applied the method to the WALS data, counting languages at the intermediate level (i.e. Germanic and Romance rather than Indo-European) as related.

The normalized results (i.e. the results have been converted so as to be represented on a single scale) for the morphological variables in the WALS are given in Table 3, where the values indicate stability (where 0.00 is completely unstable and 1.00 is completely stable). For each approach, the lowest scores are highlighted in darker grey, the highest in lighter grey.

	CM	CC	CR	D	P1	P2	W	M	Avg
Inflectional synthesis of the verb	0.38	0.15	0.10	–	0.39	0.35	0.09	0.01	0.21
Locus of marking in possessive noun phrases	0.71	0.36	0.17	0.34	0.08	0.38	0.33	0.06	0.30
Locus of marking in the clause	0.88	0.24	0.19	0.19	0.25	0.51	0.36	0.09	0.34
Reduplication	0.15	0.50	0.29	0.66	0.18	0.57	0.55	0.80	0.46
Locus of marking: whole-language typology	–	–	–	–	0.29	0.66	0.56	0.38	0.47
Fusion of selected inflectional formatives	0.65	0.68	0.76	–	0.04	0.47	0.50	0.56	0.52
Exponence of selected inflectional formatives	0.87	0.39	0.54	–	0.34	0.44	0.87	0.46	0.56
Prefixing versus suffixing in inflectional morphology	0.90	0.34	0.22	–	0.89	0.82	0.64	0.26	0.58
Syncretism in verbal person/number marking	0.64	0.69	0.80	–	0.39	0.59	0.97	0.92	0.71
Case syncretism	0.78	0.77	0.59	–	0.50	0.62	0.96	0.97	0.74

Table 3: The relative stability of morphological WALS features in different approaches

As can be seen in the table, there are substantial discrepancies between the scores of the different methods, although patterns of syncretism are generally considered to be stable by most approaches. Moreover, inflectional synthesis tends to score low in most approaches, and is in fact the lowest scoring feature in 5 of 7 approaches that have a measure for it. These differences reflect the different ideas that authors have about what stability means. For Dediu (2011), Maslova (2002, 2004) and Wichman & Holman (2009) - although very different in their algorithms - stability of a feature fundamentally means a high chance that its value is generally the same for members of the same family, i.e. a high chance that a particular feature value is retained in daughter languages of a common ancestor with that particular feature value. For Parkvall (2008) stability means resistance to borrowing. Cysouw et al. (2008), finally, consider different stability measures based on the (lack of) deviation of the distributional pattern of a feature from the expected pattern based on the overall patterning of all features. Part of the variation between the approaches, then, can be attributed to the different ways in which the authors conceptualize 'stability', but the stability values for each feature individually is of course also determined by the analysis of the different authors and the data has been categorized. The next section discusses some of the issues that concern analysis of linguistic data pertaining to morphology.

5. Analytical Problems

In spite of its centrality to linguistics, many difficulties are associated with wordhood, especially from a cross-linguistic perspective. Criteria that have been proposed to establish grammatical wordhood include the following (Haspelmath 2011):

1. Potential pauses (possible between words, not within)
2. Free occurrence (possible for words, not parts of words)
3. Mobility (words are mobile, affixes fixed)
4. Interruptability (possible within phrasal combinations, not within words)
5. Selectivity (affixes select a specific host, words do not)
6. Non-coordinatability (word can be deleted under identity, parts of words cannot)
7. Anaphoric islandhood (anaphors can refer to words, not parts of words)
8. Nonextractability (words can be extracted, parts of words cannot)
9. Morphophonological idiosyncrasies (stem-affix combinations, but not host-clitic combinations tend to show morphophonological idiosyncracies)
10. Bi-uniqueness (violations of the one-form-one-meaning principle tend to occur in morphology, not in syntax)

However, none of these criteria seem to be universally applicable in a consistent way. After reviewing the above criteria for grammatical wordhood, Haspelmath (2011: 71) concludes that "there is no definition of 'word' that can be applied to any language and that would yield consistent results that are in accord with our writing habits".

In similar vein, Schiering et al. (2010) challenge the cross-linguistic validity of the phonological word. The phonological word is often regarded as a universally present unit over which certain phonological and prosodic rules apply. Although the specific rules that apply at the level of the phonological word may differ from one language to the other, the idea is that the level of the phonological word is universal (see e.g. Nespor & Vogel 1986). On the basis of cross-linguistic bottom-up research, however, Schiering et al. (2010: 705) conclude that "the prosodic word is a language-particular category which emerges through frequent reference of phonological patterns to a given morphological construction type."

Given the above controversies[10] for the grammatical word and phonological word separately, it is perhaps not surprising that elements that lie at the crossroads of these two notions of word pose challenges for the decision what to include in measures of synthesis. Bickel & Nichols (2007), discussing synthesis, emphasize that the relevant notion of word is the grammatical rather than the phonological word. This means that they include in their measures of synthesis morphemes that are separate phonological words, but not separate grammatical words, like the ergative marker *niʔ* in Lai Chin (Bickel & Nichols 2007: 173).

Lai Chin [TIBETO-BURMAN]

(6) Tsew Máŋ **niʔ** ʔa-ka-ʇhoʔŋ
Tsew Mang **ERG** 3SG.A-1SG.P-hit
'Tsew Mang hit me.'

The opposite situation, elements that are not separate phonological words but do have the (language-internal) characteristics of grammatical words are generally described under the heading of clitics, although this is a very heterogeneous class comprising potentially very different elements (see e.g. van Gijn & Zúñiga 2014). Clitics are notoriously difficult to define cross-linguistically in their own right. Spencer & Luís (2012) mention for instance that "pinning

[10] The discussion on wordhood is broader than outlined here, but a full treatment of the topic is outside the scope of this paper.

down the notion of clitic is a little like trying to catch minnows with your bare hands" (p. xiii), and "failure to establish clear criteria has sometimes led to genuine confusion" (p. 5).

Bickel & Nichols (2007) exclude clitics from measures of synthesis and focus only on those elements that form part of the same grammatical word as their host. One of the problems, however, is that it is not always easy to decide whether elements should be regarded as part of a larger grammatical word, because some of these 'clitics' can come close to formatives (in the sense of Bickel & Nichols 2007) or affixes, so that one could argue about including these clitics in measurements of synthesis as well. This is for instance the case with ditropic clitics (Cysouw 2005) which attach phonologically to the word preceding the unit they are associated with functionally and syntactically (they must precede their syntactic hosts), as shown in (7), from Bickel & Nichols (2007: 176).

Kwakw'ala [WAKASHAN]

(7)	nep'id=**i**=**da**	gənanəm=**ẋa**	guk^{w}=**sa**	t'isəm
	throw=**SUBJ**=**DET**	child=**OBJ**	house=**INSTR**	rock
	'The child threw a rock at the house.'			

Verb-oriented clitics, whose placement depends on the position of the verb, come close to affixes. Spencer & Luís (2012) discuss Macedonian pronominal clitics which, in finite clauses are prefixed to the verb (8a) or auxiliary (8b) or, in non-finite forms, they are suffixed (8c) - examples from Spencer & Luís (2012: 65).

Macedonian [INDO-EUROPEAN, SLAVIC]

(8a)	**Mi**=**go**=dade	Vera	včera
	to.me=**it**=gave	Vera	yesterday
	'Vera gave me it yesterday'		
(8b)	**Sme**=**gi**=imale	kupeno	knigite
	AUX.1=**them**=have	bought	the.books
	'We have (reportedly) bought the books'		
(8c)	Zemi=**ja**!		
	take.IMP=**it**		
	'Take it!'		

Given these difficulties, it is not always clear whether different linguists are talking about the same thing when they speak about morphological types. Polysynthesis is particularly notorious in this respect. This point is made very clear by a discussion in Fortescue (1994), who mentions that "despite its long history (...) definitions of the term [i.e. polysynthesis -RG] in the late twentieth century are still diffuse" (p. 2601). Fortescue mentions a number of criteria that tend to occur in so-called polysynthetic languages, none of which is either necessary or sufficient.

Criteria often associated with polysynthetic languages:
a. Noun stem incorporation.
b. A large inventory of bound morphemes, limited number of stems.
c. The verbal word forms a minimal clause.
d. Pronominal markers on verbs (subject/object) and nouns (possessor).
e. Adverbial elements (e.g. location, instrument) integrated into verbs.
f Many morphological 'slots'.
g. Productive morphophonemics resulting in complex allomorphy of bound and free morphemes.
h. Non-configurational syntax.
i. Head-marking (or double marking) type of inflection.

Complications and disagreements are found for other morphological types or profiles as well. Bickel & Nichols (2007: 185-8) argue, for instance, that the term 'agglutinative' unjustly conflates aspects of the parameters fusion and flexivity in traditional approaches to morphological types. They show that fusion and flexivity are fully orthogonal parameters, since all logically possible combinations of these parameters are in fact encountered in the languages of the world.

Given the difficulties and lack of consensus in analyzing morphological structure cross-linguistically, it is imaginable that the geographical patterns found depend on the analysis chosen, and as such may be an artefact of particular choices within the analytical framework. One way forward is perhaps the abandonment of predetermined morphological types in favor of cluster analyses of refined parameters (see e.g. Bickel 2010 for an example).

6. Conclusions and Outlook

Based on the previous sections, we can identify three very basic questions without clear answers to them, which pose great challenges for assessing the stability of complex verbal morphology.

i. *What is complexity?* This question has many different potential answers and measuring these different kinds of complexity is a problem of its own.
ii. *What is stability?* The notion of stability can be conceptualized in different ways as is shown by Dediu & Cysouw (2013) although most approaches agreed that verbal synthesis as approached in Bickel & Nichols (2013a) is unstable.
iii. *What is morphology?* Different authors have pointed out several problems in defining the notion 'word' (and thus morphology) in a cross-linguistically consistent way. When trying to classify languages into morphological types these problems accumulate even further.

It is clear that there is a great need for consistent, widely accepted, and cross-linguistically applicable answers to these questions. The general picture, on the basis of the findings of Bickel & Nichols (2103a) as well as the stability studies summarized in Dediu & Cysouw (2013) suggests that morphological synthesis comes and goes relatively easily, but a more refined approach to the question is required to understand the diachronic behavior of morphology. In this respect it is good to come back to the programmatic paper by Nichols (2003) and her tripartite

division of diachronic processes into loss, acquisition, and retention. The probabilities for each of these three diachronic events to occur depend on (i) universally (cognitively, communicatively) preferred structures, (ii) family biases, and (iii) the type of contact scenario.

The first issue has been discussed extensively in the typological literature, see e.g. Du Bois (2003), Hawkins (2004), Christiansen & Chater (2008). It was mentioned above that it is not entirely clear what particular general preferences in morphological profile would be, but we might hypothesize that they include the avoidance of at least some of the types of complexity discussed in section 2 above, i.e. a general tendency to strive for transparency, isomorphism, and economy in morphology.

We know that family biases are important in shaping patterns of diversity, but in the absence of historical data for most families, the bulk of what we can observe about diachronic processes comes from the Indo-European language family. Some noticeable recent advances in increasing our knowledge on the diachrony of lesser-known families on the basis of more indirect methods (e.g. Dunn et al. 2011, Dediu & Levinson 2012, Dediu & Cysouw 2013) suggest that, although there may be some features that show similar tendencies across families, there are certainly also features that are very much determined by genealogical lineage. Moreover, rates of change may be different at different times and under different circumstances. For instance, rates of change are at the heart of a discussion on the genealogical diversity in the Americas. Historical geological and most archaeological evidence points towards a recent population of the New World some 15,000 years ago. The genealogical diversity, however, suggests more time depth than that. Nettle (1999b) argues that diversification in the Americas happened faster because the first colonizers occupied niches in a pristine environment.

Finally, the diversity of contact situations and their effects on language structures has not yet found its proper place in historical linguistics. Language contact is often considered as a unified phenomenon. Yet Muysken (2010), building on Nichols (2003), stresses that "every change is both structurally and socially embedded" (ibid. 272). He sketches 11 contact scenarios which he assesses in terms of their frequency of occurrence, symmetry configuration between the languages, linguistic features typically involved, and constraints on the contact processes. Table 4 summarizes some of this information for the three best-known contact scenarios, borrowing, convergence, and shift.

Scenario	Description	Features involved
Borrowing	Individual language items spread from one language to another.	relatively concrete, phonetic substance
Convergence	Under conditions of prolonged bilingualism, languages can become more similar	surface features, e.g. semantic categories, word order
Shift	A group of speakers of L1 shifts to another language (L2)	abstract features L1 can survive in the version of L2 that is acquired

Table 4: Features involved in borrowing, convergence, and shift

As can be seen, the processes and their effects on language structure can be quite different from one situation to the next.

The above considerations make it clear that the way forward is to build up a greater knowledge base from which we can generalize with more precision on the basis of case studies that target (subdomains of) verbal morphology in particular genealogical and areal contexts. The

present special issue is meant to provide a collection of such areal and genealogical case studies from all over the globe, providing evidence that the fate of verbal morphology is in fact highly dependent on the genealogical and areal context. I briefly summarize the contributions to the special issue here.

In his contribution, **Fernando Zúñiga** focuses on Ecuadorian Quechuan varieties, whose morphological structures are poorer when compared to their relatives in the south. For instance, Ecuadorian Quechuan languages have lost the bound possessive markers, some TAM markers, the inclusive-exclusive distinction and the transition suffixes in the person marking system of the verb. Zúñiga assesses the claims that (i) these and other changes were brought about gradually, under the influence of an unknown substrate language, and (ii) the agglutinative character has 'protected' some parts of Ecuadorian Quechua against total loss. Zúñiga concludes that the available evidence does not allow for either a refutation or a confirmation of the hypotheses.

Marianne Mithun discusses the geographical distribution of some of the hallmarks of complex verbal morphology in North American indigenous languages: person marking on the verb (allowing for holophrasis), incorporation, and the use of affixes with rather lexical content. She shows that the existence of each of these characteristics extends over vast contiguous territories, across language families, clearly suggesting contact effects. Mithun identifies as least two relevant factors to explain the present distribution: (i) relatively independent grammaticalization processes without large-scale adult L2 learning and (ii) an important role for widespread child bilingualism during the early stages of contact.

Scott Delancey traces the diachronic development of person marking systems in Trans-Himalayan languages, which show a strikingly wide range of diversity when it comes to the complexity of verbal morphology in general and person indexing systems in particular. Delancey traces the diachronic developments that have led to the present situation. He concludes that apart from contact-induced morphological simplification, there are instances of long-term stability of morphological complexity, as well as innovations increasing the complexity. These latter two developments are particularly found in relatively isolated mountainous areas, and seem to be unrelated to language contact.

Chibchan languages show heterogeneous morphosyntactic strategies for person indexing: whereas some languages show synthetic structures, others have more analytic strategies, yet others have a mix of the two. **Matthias Pache** addresses the question whether these different strategies present ancient retentions or rather relatively recent innovations. Pache argues that the present diverse picture of different strategies did not necessarily take a long time to develop, especially given that different strategies are found within subbranches of the family and even within single languages. Relatively rapid processes of grammaticalization and perhaps even diachronic detachment, in combination with a variety of sources for the person markers have led to the present picture, mediated by the more general principle of cognitive accessibility.

Rik van Gijn focuses on a linguistic area in South America, the Guaporé-Mamoré, for which it has been claimed that the widespread occurrence of (poly-)synthetic morphology is due to convergence through long-term language contact. Based on a systematic comparison of the morphological structures he concludes that, apart from the north-eastern sub-area where languages tend to be morphologically poor, there is a common morphological profile for the languages of the area which can be described as highly synthetic and concatenative, often allowing for some form of noun or classifier incorporation, and with a substantial amount of prefixes. Based on the premise that contact-induced change takes place on the basis of semantics,

he identifies 15 commonly morphologized functional categories, and discusses prefixed valency-changing morphology as an areal feature in more detail.

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